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## PATENT ABSTRACTS OF JAPAN

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## (54) OPTICAL MEMBER AND LIQUID CRYSTAL DISPLAY DEVICE

## (57)Abstract:

PROBLEM TO BE SOLVED: To prevent blocking by the rough surface added to the outer surface of a protective film even when optical material is transferred or stored in a stacked state by covering the surface of the optical material, especially one surface of the optical material with a protective film having specified or higher surface roughness of the outer surface by adhering.

SOLUTION: The surface of an optical material 2, especially one surface is covered with a protective film 1 having  $\geq 0.03 \mu\text{m}$  surface roughness Ra of the outer surface by adhering, and if necessary, a separator is applied with an adhesive layer 3 on the other surface of the optical material 2 to prepare the optical member. In this method, a polarizing plate (optical material) 2 may be a reflection type or semitransmission type. Or, a phase difference plate may be produced for proper purposes such as a  $1/2$  or  $1/4$  wavelength plate or for compensation of the viewing angle. As for the polarizing plate 2, for example, a film prepared by adsorbing iodine and/or a dichroic dye to a hydrophilic polymer film and stretching, or a polarizing film consisting of a polyene oriented film can be used.



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**CLAIMS**

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[Claim(s)]

[Claim 1] Optical faculty material which surface roughness Ra of an outside surface carries out adhesion covering of the front face of an optical material with a protection film 0.03 micrometers or more, and is characterized by the bird clapper.

[Claim 2] a claim 1 -- setting -- a protection film -- one side of an optical material -- having -- an optical material -- on the other hand -- being alike -- the optics which comes to have separator through an adhesive layer -- a member

[Claim 3] Optical faculty material which is that in which an optical material has a polarizing plate; it and a phase contrast board, or an improvement board in brightness at least in a claim 1 or 2.

[Claim 4] The liquid crystal display characterized by providing an optical member according to claim 1 to 3.

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## DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] this invention relates to the optical member which cannot produce blocking by pile easily and is excellent in assembly efficiency, such as a liquid crystal display.

[0002]

[Background of the Invention] A polarizing plate, a phase contrast board, etc. which are used for formation of a liquid crystal display (LCD) etc. Although used as an optical material which attached beforehand the adhesive layer for pasting up a polarizing plate and a phase contrast board on a laminating elliptically-polarized-light board and a polarizing plate with other members, such as a liquid crystal cell, beforehand through an adhesive layer aiming at the increase in efficiency of variation prevention of quality, LCD assembly, etc. In this case, practical use is presented as an optical member which carried out adhesion covering with the protection film so that the front face of an optical material might not be damaged.

[0003] However, if it was in the conventional optical member, after accumulating it and conveying or keeping it, when the automatic-assembling work of a liquid crystal display etc. was presented with it, two or more units were incorporated without an optical member being inseparable for every unit because of blocking, assembly equipment detected the abnormality, the assembly line stopped, and there was a trouble of reducing assembly efficiency.

[0004]

[The technical technical problem of invention] a halt of the assembly line according [ even if this invention performs transportation, storage, etc. where it was hard to be generated and blocking is repeated, and it presents the automatic-assembling work of a liquid crystal display etc. with it, can separate an optical member from the pile object smoothly for every unit, and ] to the incorporation of two or more units -- avoidable -- a liquid crystal display etc. -- assembly -- the optics which can be manufactured efficiently -- let development of a member be a technical problem

[0005]

[Means for Solving the Problem] this invention offers the front face of an optical material, and the optical member which surface roughness Ra of an outside surface comes to carry out adhesion covering especially of the one side with a protection film 0.03 micrometers or more, and is characterized by the thing of an optical material for which it is alike on the other hand, and has separator through an adhesive layer if needed

[0006]

[Effect of the Invention] a halt of the assembly line the split face given to the outside surface of a protection film even if it presented transportation, storage, etc. in the state where it put according to the optical member of this invention prevents blocking, and present the automatic-assembling work of a liquid crystal display etc. with the pile object, can separate an optical member smoothly for every unit of the, and according to the incorporation of two or more units -- being avoidable -- a liquid crystal display etc. -- assembly -- it can manufacture efficiently

[0007]

[The operation gestalt of invention] surface roughness Ra of an outside surface comes to carry out adhesion covering especially of the one side with a protection film 0.03 micrometers or more, and the optical member by this invention consists of a front face of an optical material, and a thing of an optical material which is alike on the other hand and has separator through an adhesive layer if needed. The example was shown in drawing 1 - drawing 3. For an adhesive layer and 4, separator and 5 are [ a polarizing plate, and 3, 31 and 32 / 1 / a protection film and 2 / a phase contrast board and 6 ] the improvement boards in brightness.

[0008] An optical material may be used for formation of liquid crystal displays, such as a polarizing plate, a phase contrast board, a elliptically-polarized-light board that carried out the laminating of them, and an improvement board in brightness, etc., and there is [ proper ] especially no limitation about the kind. Therefore, polarizing plates may be a reflected type, a half-transparency type thing, etc. Moreover, a phase contrast board may also have the proper purposes, such as one half, a wavelength plate of 1 / 4 grades, and viewing-angle compensation. In addition, in the case of the laminating type optical material like said elliptically-polarized-light board, the laminating may be performed through proper adhesion meanses, such as an adhesive layer.

[0009] What iodine and/or the dichromatic dye were made to stick to the hydrophilic high polymer film like a polyvinyl alcohol system film, a partial formal-ized polyvinyl alcohol system film, and an ethylene-vinylacetate-copolymer system partial saponification film, and was extended as an example of the polarizing plate incidentally described above, the polarization film which consists of a polyene oriented film like the dehydration processing object of polyvinyl alcohol or the desalting acid-treatment object of a polyvinyl chloride are raised. Moreover, a polarizing plate may have transparent protection layer to one side or both sides of a polarization film.

[0010] It is that by which the reflected type polarizing plate prepared the reflecting layer in the polarizing plate on the other hand, and it is for forming the liquid crystal display of the type which is made to reflect the incident light from a check-by-looking side (display side), and is displayed etc., and built-in of the light sources, such as a back light, can be omitted, and it has an advantage, such as being easy to achieve thin shape-ization of a liquid crystal display. A method with the proper method which attaches the reflecting layer which becomes one side of a polarizing plate from a metal etc. through transparent protection layer etc. if needed can perform formation of a reflected type polarizing plate.

[0011] What attached the foil and vacuum evaporation film which consist of reflection nature metals, such as aluminum, to one side of the transparent protection layer which carried out mat processing as an example of a reflected type polarizing plate if needed, and formed the reflecting layer in it is raised. Moreover, the aforementioned transparent protection layer is made to contain a particle, it considers as surface detailed irregularity structure, and what has the reflecting layer of detailed irregularity structure on it is raised. In addition, the use gestalt of a reflecting layer in the state where the reflector was covered with transparent protection layer, the polarizing plate, etc. is more desirable than the point of fall prevention of the reflection factor by oxidization, as a result long-term duration of an initial reflection factor, the point of evasion of separately an attachment of a protective layer, etc.

[0012] The reflecting layer of said detailed irregularity structure diffuses an incident light by the scattered reflection, prevents directivity and the appearance [ GIRAGIRA / appearance ], and has the advantage which can suppress the nonuniformity of light and darkness. Moreover, the transparent protection layer of particle content has the advantage which is spread in case an incident light and its reflected light penetrate it, and can suppress light-and-darkness nonuniformity more.

[0013] Formation of the reflecting layer of the detailed irregularity structure in which the surface detailed irregularity structure of transparent protection layer was made to reflect can be performed by the method of attaching a metal directly on the surface of transparent protection layer by methods with proper vacuum evaporation method, plating method, etc., such as for example, a vacuum deposition method, an ion plating method, and a sputtering method, etc.

[0014] In addition, the polymer which is excellent in transparency, a mechanical strength, thermal stability, moisture cover nature, etc. is preferably used for formation of the transparent protection layer

in the above-mentioned polarizing plate. As the example, the resin of heat-hardened types, such as a polyester system resin, an acetate system resin, a polyether sulphone system resin and a polycarbonate system resin, a polyamide system resin and a polyimide system resin, a polyolefine system resin and an acrylic resin or acrylic and an urethane system, an acrylic urethane system, an epoxy system, and a silicone system, or an ultraviolet-rays hardening type etc. is raised.

[0015] Although transparent protection layer considered as the application method and film of polymer, it may form by the method with a proper laminating method etc., and you may determine thickness suitably. Especially generally let 1-300-micrometer 500 micrometers or less above all be the thickness of 5-200 micrometers. In addition, transparent particles which consist of the silica whose mean particle diameter is 0.5-50 micrometers, for example, an alumina, a titania and a zirconia, a tin oxide, indium oxide and a cadmium oxide, an antimony oxide, etc. as a particle which formation of the transparent protection layer of surface detailed irregularity structure is made to contain, such as an organic system particle which a conductive thing also becomes from the polymer for which a bridge is not constructed [ a certain inorganic system particle, bridge formation, or ], are used. the amount of the particle used -- per [ 2 ] transparent resin 100 weight section - 50 weight sections -- 5 - 25 weight section is common above all

[0016] On the other hand, as an example of the above-mentioned phase contrast board, what supported with the film the polyolefine of a polycarbonate, polyvinyl alcohol and polystyrene, a polymethylmethacrylate and polypropylene, or others, the form birefringence film which comes to carry out extension processing of the film which consists of proper polymer like a polyarylate or a polyamide and the oriented film of a liquid crystal polymer, and the orientation layer of a liquid crystal polymer is raised.

[0017] A phase contrast board may be the inclination oriented film which may have the proper phase contrast according to the purposes of use, such as a thing aiming at compensation of for example, various wavelength plates, coloring by the birefringence of a liquid crystal layer, a viewing angle, etc., and controlled the refractive index of the thickness direction. Moreover, you may be what carried out the laminating of two or more sorts of phase contrast boards, and controlled optical properties, such as phase contrast. In addition, the aforementioned inclination oriented film can paste up a thermal-contraction nature film for example, on a polymer film, and can obtain a polymer film to operation-ization of the shrinkage force by heating with extension processing or/and the method that carries out contraction processing, the method to which slanting orientation of the liquid crystal polymer is carried out.

[0018] The optical material may consist of what carried out the laminating of two-layer or the three or more-layer optical layer like the layered product of the above-mentioned elliptically-polarized-light board and the above-mentioned reflected type polarizing plate, or a phase contrast board. Therefore, you may be what combined a polarizing plate 2, the phase contrast board 5 or/, and the improvement board 6 in brightness as illustrated to drawing 2 or drawing 3 , the thing which combined the reflected type polarizing plate, the half-transparency type polarizing plate, and the phase contrast board.

[0019] Although the optical material which carried out the laminating of two-layer or the three or more-layer optical layer can be formed also by the method which carries out a laminating separately one by one in manufacture process, such as a liquid crystal display, some which carried out the laminating beforehand and which were used as optical material have the advantage in which it excels in stability, assembly-operation nature, etc. of quality, manufacture efficiency, such as a liquid crystal display, is raised, and it deals.

[0020] In addition, nominal has been carried out to the polarization division plate etc. by the improvement board in brightness which is combined with a polarizing plate if needed [ above-mentioned ], and is used as optical material, if incidence of the natural light is carried out, the linearly polarized light of a predetermined polarization shaft or the circular polarization of light of the predetermined direction will be reflected, and other light shows the property to penetrate and is used for the purpose of improvement in the brightness of a liquid crystal display.

[0021] Namely, while the improvement board in brightness carries out incidence of the light from the light sources, such as a back light, and obtains the transmitted light of a predetermined polarization state

While aiming at increase in quantity of the light which is made to reverse the reflected light through a reflecting layer etc., is made to carry out re-incidence to the improvement board in brightness, is made to penetrate the part or all as a light of a predetermined polarization state, and penetrates the improvement board in brightness. It is used for the purpose of raising brightness with the method which aims at increase of the quantity of light which supplies the polarization which cannot be easily absorbed by the polarizing plate and can be used for a liquid crystal display etc.

[0022] therefore, as an improvement board in brightness, like the multilayer layered product of the thin film from which the multilayered film and refractive-index anisotropy of a dielectric are different, for example what shows the property of penetrating the linearly polarized light of a predetermined polarization shaft, and reflecting other light (3 M company make --) cholesteric-liquid-crystal layers, such as D-BEF, and the thing (the NITTO DENKO CORP. make --) which supported the oriented film and its orientation liquid crystal layer of cholesteric-liquid-crystal polymer on the film base material above all Right-and-left one [, such as PCF350, and a product made from Merck, Transmax, / like ] circular polarization of light is reflected, and other light can use what has the proper thing which shows the property to penetrate.

[0023] It can be made to penetrate efficiently with the improvement board in brightness of the type which penetrates the linearly polarized light of said predetermined polarization shaft, suppressing the absorption loss by the polarizing plate by arranging a polarization shaft and carrying out incidence of the transmitted light to a polarizing plate as it is.

[0024] On the other hand, although incidence can be carried out to a polarizing plate as it is with the improvement board in brightness of the type which penetrates the circular polarization of light like a cholesteric-liquid-crystal layer, it is more desirable than the point which suppresses an absorption loss to linearly-polarized-light-ize the transparency circular polarization of light through a phase contrast board, and to carry out incidence to a polarizing plate. incidentally -- as the phase contrast board -- 1/4 wavelength plate -- using -- a polarizing plate and the improvement in brightness -- by arranging to a wooden floor, the circular polarization of light is convertible for the linearly polarized light

[0025] The phase contrast board which functions as 1/4 wavelength plate in the latus wavelength ranges, such as a light region, can be obtained with the method which superimposes the phase contrast layer which shows the phase contrast layer which functions as 1/4 wavelength plate to the homogeneous lights, such as light with a wavelength of 550nm, and other phase contrast properties, for example, the phase contrast layer which functions as 1/2 wavelength plate. therefore, a polarizing plate and the improvement in brightness -- the phase contrast board arranged to a wooden floor may consist of a phase contrast layer more than one layer or two-layer

[0026] In addition, also about a cholesteric-liquid-crystal layer, although reflected wave length is different, by considering as two-layer or the arrangement structure superimposed three or more layers in combination, what reflects the circular polarization of light in the latus wavelength ranges, such as a light region, can be obtained, and the transparency circular polarization of light of the latus wavelength range can be acquired based on it.

[0027] As for the optical member by this invention, surface roughness Ra of an outside surface carries out adhesion covering of the front face of an optical material with a protection film 0.03 micrometers or more for the purpose of injury prevention etc. although a protection film can be prepared in front reverse side both sides of an optical material -- general -- like the example of drawing -- the protection film 1 -- one side of an optical material -- preparing -- an optical material -- on the other hand -- being alike -- it considers as the gestalt which formed the adhesive layer 3 which carried out tentative installation covering with separator 4

[0028] Although a protection film can be formed only in protective-group material in the above, it is formed so that an adhesive layer may be prepared in protective-group material and protective-group material can generally be exfoliated from an optical material with the adhesive layer. On the other hand, separator is formed so that it can exfoliate in an interface with the adhesive layer 3 which it pastes up.

[0029] Therefore, usually, in the case of a protection film, the front face of an optical material can be exposed by the ablation, when it is separator, an adhesive layer can remain in an optical member by the



ablation, and the adhesive layer can be used for adhesion with other members, such as a liquid crystal cell. In addition, it can also form so that the adhesive layer which it pastes up like separator may be made to remain for an optical material also about a protection film.

[0030] A proper slime and a proper binder can be used for formation of the adhesive layer prepared in said protective-group material, or the adhesive layer which makes an optical material remain, and there is especially no limitation in it. Incidentally as the example, what makes base polymer proper polymer, such as an acrylic polymer, silicone system polymer, polyester and polyurethane, a polyamide and a polyether, a fluorine system, and a rubber system, is raised.

[0031] Above all, like an acrylic binder, it excels in optical transparency, moderate wettability and moderate cohesiveness, and an adhesive adhesion property are shown in formation of an adhesive layer which makes an optical material remain, and what is excellent in weatherability, thermal resistance, etc. can use for it preferably.

[0032] Moreover, the adhesive layer which makes an optical material remain in addition to the above has a low moisture absorption, and it is more desirable than points, such as a fall of the optical property by prevention of the foaming phenomenon by moisture absorption, or a peeling phenomenon, the differential thermal expansion, etc., curvature prevention of a liquid crystal cell, as a result the plasticity of a liquid crystal display that is excellent in endurance with high quality, to be formed in what is excellent in thermal resistance.

[0033] The adhesive layer may contain the proper additive by which adhesive layers, such as resins of a natural product or a compost, a bulking agent which consists of an adhesive grant resin, a glass fiber, a glass bead and a metal powder, other inorganic powder, etc. above all, a pigment and a coloring agent, and an antioxidant, have been added. Moreover, the adhesive layer which makes an optical material remain contains a particle, and may show optical diffusibility.

[0034] A proper method can perform the attachment of the adhesive layer to protective-group material or an optical material. Incidentally, as the example, make the solvent which consists of the independent object or mixture of a proper solvent, such as toluene and ethyl acetate, for example dissolve or distribute a slime or its constituent, and about 10 - 40% of the weight of binder liquid is prepared. The method which attaches it directly on protective-group material or an optical material by proper expansion methods, such as a flow casting method and a coating method, or the method which forms an adhesive layer on separator according to the above, and carries out \*\* arrival of it on protective-group material or an optical material is held.

[0035] An adhesive layer can also be prepared in protective-group material or an optical member as a superposition layer of things, such as different composition or a kind. The thickness of an adhesive layer can be suitably determined according to the purpose of use, adhesive strength, etc., and, especially generally is set to 10-100 micrometers 5-200 micrometers above all 1-500 micrometers. In addition, the adhesive layer prepared in protective-group material or an optical member may have composition, a the same kind, etc., and may differ.

[0036] The proper thin nerve according to the former, such as plastic film, a rubber sheet, paper and cloth, a nonwoven fabric, a network and a foaming sheet, and metallic foils, those lamination objects, can be used for the protective-group material which forms a protection film. The thickness of protective-group material can be suitably determined according to intensity etc., and, especially generally is set to 10-200 micrometers 5-300 micrometers above all 500 micrometers or less.

[0037] In addition, when the front face of protective-group material used as an outside surface is smooth, based on Ra, surface roughness 0.03 micrometers or more can be formed with the application of proper split-face-ized mode of processing, such as for example, buff processing and embossing. 0.04-10 micrometers especially of 5 micrometers or less of desirable surface roughness Ra [ in / the outside surface of a protection film / from points by pile, such as prevention of blocking and prevention of a fall of an optical element, the optical property by reflection of the surface roughness to an adhesive layer, or an adhesion property, ] are 0.05-1 micrometer above all.

[0038] On the other hand, the separator which carries out tentative installation covering of the adhesive layer side aims at preventing the contamination etc. until it presents practical use with an adhesive layer.

The method which establishes the ablation coat by proper removers, such as a silicone system, a long-chain alkyl system, a fluorine system, and a molybdenum sulfide, in the proper thin nerve according to the aforementioned protective-group material if needed can perform formation of separator.

[0039] In addition, each class, such as a polarizing plate which forms the above-mentioned optical member, a phase contrast board, an improvement board in brightness, and transparent protection layer, an adhesive layer, may be what gave ultraviolet-absorption ability with the method with the proper method processed with ultraviolet ray absorbents, such as for example, a salicylate system compound, a benzo phenol system compound, a benzotriazol system compound, and a cyanoacrylate system compound, a nickel complex salt system compound.

[0040] The optical member by this invention can be preferably used for formation of various equipments, such as a liquid crystal display, etc. The liquid crystal display can be formed as what has the proper structure according to the former, such as a penetrated type which comes to arrange the optical member by this invention on one side or the both sides of a liquid crystal cell, and a reflected type or type both for transparency / reflective.

[0041]

[Example] The protection film which comes to prepare an acrylic adhesive layer with a thickness of 20 micrometers in the rear face of polyester film with a thickness of 50 micrometers was pasted up on one side of a polarizing plate with a thickness of about 180 micrometers which comes to paste [ a triacetyl-cellulose film ] the both sides of the polarization film which carried out extension processing and formed the polyvinyl alcohol film with an example 1 thickness of 80 micrometers 5 times in iodine solution through a polyvinyl alcohol system glue line through the adhesive layer.

[0042] next, on the other hand, the aforementioned polarizing plate was alike, the acrylic adhesive layer with a thickness of 25 micrometers was prepared in the rear face of the separator which consists of polyester film with a thickness of 38 micrometers through the silicone system ablation coat, it was pasted up with separator, and the optical member was obtained In addition, surface roughness Ra of the outside surface of said protection film was 0.06 micrometers in measurement by the surface roughness meter (it is the same the Tokyo Seimitsu Co., Ltd. make, the surfboard COM, and the following).

[0043] Removed the separator of example 2 polarizing plate, pasted up on it the phase contrast board which comes to carry out uniaxial-stretching processing of the polycarbonate film at 170 degrees C, and the acrylic adhesive layer with a thickness of 25 micrometers prepared in separator was pasted up on the phase contrast board with separator, and also the optical member was obtained according to the example 1.

[0044] As an example 3 phase-contrast board, the thing (the Fuji Photo Film Co., Ltd. make, WVA02A) which comes to support the discotheque liquid crystal layer of inclination orientation in a film base material was used, and also the optical member was obtained according to the example 2.

[0045] Pasted up the improvement board in brightness (the NITTO DENKO CORP. make, PCF350) which consists of a layered product of the film base material and 1/4 wavelength plate which support an example 4 cholesteric-liquid-crystal layer through the acrylic adhesive layer with a thickness of 25 micrometers on the polarizing plate which removed the protection film, and the removed protection film was pasted up on the exposed surface of the improvement board in brightness, and also the optical member was obtained according to the example 1.

[0046] As an example protection film of comparison, surface roughness Ra of an outside surface used what is 0.02 micrometers, and also the optical member was obtained according to the example 1.

[0047] the optics acquired in the evaluation examination example and the example of comparison -- 30 units of a member were accumulated one by one, after carrying out seal processing under reduced pressure and leaving it for 48 hours with the inner bag made from polyethylene, and the outside bag made from moisture-proof aluminum, it opened, and the existence of blocking was investigated The result was shown in the following \*\*.

[0048]

Example 1 Example 2 Example 3 Example 4 Ratio \*\* Example Blocking Nothing Nothing Nothing Nothing It is and is [0049]. In the above, although each unit blocked through the protection film plane in

the example of comparison, in the examples 1-4, it did not block, and the automatic adhesion processing machine was presented with the pile object, it dissociated smoothly for every unit, adhesion processing could be carried out at the liquid crystal cell, and the stop of the equipment by the incorporation of two or more units was not produced.

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**DESCRIPTION OF DRAWINGS**

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[Brief Description of the Drawings]

[Drawing 1] The cross section of the example of optical faculty material

[Drawing 2] The cross section of other examples of optical faculty material

[Drawing 3] The cross section of the example of optical faculty material of further others

[Description of Notations]

1: Protection film

2: Polarizing plate (optical material)

3, 31, 32: Adhesive layer

4: Separator

5: Phase contrast board (optical material)

6: Improvement board in brightness (optical material)

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(54) 【発明の名称】 光学部材及び液晶表示装置

(57) 【要約】

【課題】 ブロッキングを生じ難くて積み重ねた状態で輸送や保管等を行ってそれを液晶表示装置等の自動組立作業に供しても、その積み重ね体より光学部材を単位毎に円滑に分離できて複数単位の取り込みによる組立ラインの停止を回避でき、液晶表示装置等を組立効率よく製造できる光学部材の開発。

【解決手段】 光学素材 (2) の表面、特にその片面を外表面の表面粗さ Ra が 0. 03  $\mu$ m 以上の保護フィルム (1) にて接着被覆してなり、必要に応じ光学素材の他面に粘着層 (3) を介しセパレータ (4) を有する光学部材。

【効果】 保護フィルムの外表面に付与した粗面が積み重ねた状態でのブロッキングを防止する。



## 【特許請求の範囲】

【請求項1】 光学素材の表面を外表面の表面粗さ $R_a$ が $0.03\mu\text{m}$ 以上の保護フィルムにて接着被覆してなることを特徴とする光学部材。

【請求項2】 請求項1において、保護フィルムを光学素材の片面に有して光学素材の他面には粘着層を介しセパレータを有してなる光学部材。

【請求項3】 請求項1又は2において、光学素材が偏光板又はそれと位相差板若しくは輝度向上板を少なくとも有するものである光学部材。

【請求項4】 請求項1～3に記載の光学部材を具備することを特徴とする液晶表示装置。

## 【発明の詳細な説明】

## 【0001】

【発明の技術分野】本発明は、積み重ねによるブロッキングを生じにくくて液晶表示装置等の組立効率に優れた光学部材に関する。

## 【0002】

【発明の背景】液晶表示装置(LCD)の形成などに用いられる偏光板や位相差板等は、品質のバラツキ防止やLCD組立等の効率化などを目的に、例えば偏光板と位相差板を粘着層を介して予め積層した楕円偏光板や、偏光板に液晶セル等の他部材と接着するための粘着層を予め付設した光学素材などとして用いられるが、その場合に光学素材の表面が損傷されないように保護フィルムで接着被覆した光学部材として実用に供されている。

【0003】しかしながら、従来の光学部材にあってはそれを積み重ねて輸送又は保管した後それを液晶表示装置の自動組立作業等に供すると、ブロッキングのために光学部材を単位毎に分離できずに複数単位を取り込み、組立装置がその異常を検知して組立ラインが停止し、組立効率を低下させる問題点があった。

## 【0004】

【発明の技術的課題】本発明は、ブロッキングを生じ難くて積み重ねた状態で輸送や保管等を行ってそれを液晶表示装置等の自動組立作業に供しても、その積み重ね体より光学部材を単位毎に円滑に分離できて複数単位を取り込みによる組立ラインの停止を回避でき、液晶表示装置等を組立効率よく製造することができる光学部材の開発を課題とする。

## 【0005】

【課題の解決手段】本発明は、光学素材の表面、特にその片面を外表面の表面粗さ $R_a$ が $0.03\mu\text{m}$ 以上の保護フィルムにて接着被覆してなり、必要に応じ光学素材の他面に粘着層を介しセパレータを有することを特徴とする光学部材を提供するものである。

## 【0006】

【発明の効果】本発明の光学部材によれば、積み重ねた状態で輸送や保管等に供しても、保護フィルムの外表面に付与した粗面がブロッキングを防止し、その積み重ね

体を液晶表示装置等の自動組立作業に供して光学部材をその単位毎に円滑に分離でき、複数単位を取り込みによる組立ラインの停止を回避できて液晶表示装置等を組立効率よく製造することができる。

## 【0007】

【発明の実施形態】本発明による光学部材は、光学素材の表面、特にその片面を外表面の表面粗さ $R_a$ が $0.03\mu\text{m}$ 以上の保護フィルムにて接着被覆してなり、必要に応じ光学素材の他面に粘着層を介しセパレータを有するものからなる。その例を図1～図3に示した。1が保護フィルム、2が偏光板、3、31、32が粘着層、4がセパレータ、5が位相差板、6が輝度向上板である。

【0008】光学素材は、例えば偏光板や位相差板、それらを積層した楕円偏光板や輝度向上板等の液晶表示装置の形成などに用いられる適宜なものであってよく、その種類について特に限定はない。従って偏光板は、反射型や半透過型のものなどであってもよい。また位相差板も、 $1/2$ や $1/4$ 等の波長板や視角補償などの適宜な目的を有するものであってよい。なお前記した楕円偏光板の如き積層タイプの光学素材の場合、その積層は粘着層等の適宜な接着手段を介し行われたものであってよい。

【0009】ちなみに前記した偏光板の具体例としては、ポリビニルアルコール系フィルムや部分ホルマール化ポリビニルアルコール系フィルム、エチレン・酢酸ビニル共重合体系部分ケン化フィルムの如き親水性高分子フィルムにヨウ素及び／又は二色性染料を吸着させて延伸したもの、ポリビニルアルコールの脱水処理物やポリ塩化ビニルの脱塩酸処理物の如きポリエン配向フィルムからなる偏光フィルムなどがあげられる。また偏光板は、偏光フィルムの片面又は両面に透明保護層を有するものなどであってもよい。

【0010】一方、反射型偏光板は、偏光板に反射層を設けたもので、視認側(表示側)からの入射光を反射させて表示するタイプの液晶表示装置などを形成するためのものであり、バックライト等の光源の内蔵を省略できて液晶表示装置の薄型化をはかりやすいなどの利点を有する。反射型偏光板の形成は、必要に応じ透明保護層等を介して偏光板の片面に金属等からなる反射層を付設する方式などの適宜な方式にて行うことができる。

【0011】反射型偏光板の具体例としては、必要に応じマット処理した透明保護層の片面に、アルミニウム等の反射性金属からなる箔や蒸着膜を付設して反射層を形成したものなどがあげられる。また前記の透明保護層に微粒子を含有させて表面微細凹凸構造とし、その上に微細凹凸構造の反射層を有するものなどもあげられる。なお反射層は、その反射面が透明保護層や偏光板等で被覆された状態の使用形態が、酸化による反射率の低下防止、ひいては初期反射率の長期持続の点や、保護層の別途付設の回避の点などより好ましい。

【0012】前記した微細凹凸構造の反射層は、入射光を乱反射により拡散させて指向性やギラギラした見栄えを防止し、明暗のムラを抑制しうる利点などを有する。また微粒子含有の透明保護層は、入射光及びその反射光がそれを透過する際に拡散されて明暗ムラをより抑制しうる利点なども有している。

【0013】透明保護層の表面微細凹凸構造を反映させた微細凹凸構造の反射層の形成は、例えば真空蒸着方式、イオンプレーティング方式、スパッタリング方式等の蒸着方式やメッキ方式などの適宜な方式で金属を透明保護層の表面に直接付設する方法などにより行うことができる。

【0014】なお上記した偏光板における透明保護層の形成には、透明性、機械的強度、熱安定性、水分遮蔽性等に優れるポリマーなどが好ましく用いられる。その例としては、ポリエステル系樹脂やアセテート系樹脂、ポリエーテルサルホン系樹脂やポリカーボネート系樹脂、ポリアミド系樹脂やポリイミド系樹脂、ポリオレフィン系樹脂やアクリル系樹脂、あるいはアクリル系やウレタン系、アクリルウレタン系やエポキシ系やシリコン系等の熱硬化型、ないし紫外線硬化型の樹脂などがあげられる。

【0015】透明保護層は、ポリマーの塗布方式やフィルムとしたものの積層方式などの適宜な方式で形成してよく、厚さは適宜に決定してよい。一般には500 $\mu\text{m}$ 以下、就中1~300 $\mu\text{m}$ 、特に5~200 $\mu\text{m}$ の厚さとされる。なお表面微細凹凸構造の透明保護層の形成に含有させる微粒子としては、例えば平均粒径が0.5~50 $\mu\text{m}$ のシリカやアルミナ、チタニアやジルコニア、酸化錫や酸化インジウム、酸化カドミウムや酸化アンチモン等からなる、導電性のこともある無機系微粒子、架橋又は未架橋のポリマー等からなる有機系微粒子などの透明微粒子が用いられる。微粒子の使用量は、透明樹脂100重量部あたり2~50重量部、就中5~25重量部が一般的である。

【0016】一方、上記した位相差板の具体例としては、ポリカーボネートやポリビニルアルコール、ポリスチレンやポリメチルメタクリレート、ポリプロピレンやその他のポリオレフィン、ポリアリレートやポリアミドの如き適宜なポリマーからなるフィルムを延伸処理してなる複屈折性フィルムや液晶ポリマーの配向フィルム、液晶ポリマーの配向層をフィルムにて支持したものなどがあげられる。

【0017】位相差板は、例えば各種波長板や液晶層の複屈折による着色や視角等の補償を目的としたものなどの使用目的に応じた適宜な位相差を有するものであってよく、厚さ方向の屈折率を制御した傾斜配向フィルムであってもよい。また2種以上の位相差板を積層して位相差等の光学特性を制御したものなどであってもよい。なお前記の傾斜配向フィルムは、例えばポリマーフィルム

に熱収縮性フィルムを接着して加熱によるその収縮力の作用化にポリマーフィルムを延伸処理又は/及び収縮処理する方式や液晶ポリマーを斜め配向させる方式などにより得ることができる。

【0018】光学素材は、上記した楕円偏光板や反射型偏光板や位相差板の積層体の如く、2層又は3層以上の光学層を積層したものからなっているもよい。従って図2や図3に例示した如く偏光板2と位相差板5又は/及び輝度向上板6を組合せたもの、反射型偏光板や半透過型偏光板と位相差板を組合せたものなどであってよい。

【0019】2層又は3層以上の光学層を積層した光学素材は、液晶表示装置等の製造過程で順次別個に積層する方式にても形成しうるものであるが、予め積層して光学素材としたものは、品質の安定性や組立作業性等に優れて液晶表示装置などの製造効率を向上させうる利点がある。

【0020】なお上記した必要に応じて偏光板と組み合わせられて光学素材とされる輝度向上板は、偏光分離板などと称呼されることのあるもので、自然光を入射させると所定偏光軸の直線偏光又は所定方向の円偏光を反射し、他の光は透過する特性を示すものであり、液晶表示装置の輝度の向上を目的に用いられるものである。

【0021】すなわち輝度向上板は、例えばバックライト等の光源からの光を入射させて所定偏光状態の透過光を得ると共に、反射光を反射層等を介し反転させて輝度向上板に再入射させ、その一部又は全部を所定偏光状態の光として透過させて輝度向上板を透過する光の増量を図ると共に、偏光板に吸収されにくい偏光を供給して液晶表示等に利用しうる光量の増大を図る方式などにより輝度を向上させることを目的に用いられるものである。

【0022】従って輝度向上板としては、例えば誘電体の多層薄膜や屈折率異方性が相違する薄膜フィルムの多層積層体の如き、所定偏光軸の直線偏光を透過して他の光は反射する特性を示すもの(3M社製、D-BEF等)、コレステリック液晶層、就中コレステリック液晶ポリマーの配向フィルムやその配向液晶層をフィルム基材上に支持したもの(日東電工社製、PCF350やMerck社製、Transmax等)の如き、左右一方の円偏光を反射して他の光は透過する特性を示すものなどの適宜なものをいう。

【0023】前記した所定偏光軸の直線偏光を透過するタイプの輝度向上板では、その透過光をそのまま偏光板に偏光軸を揃えて入射させることにより偏光板による吸収ロスを抑制しつつ効率よく透過させることができる。

【0024】一方、コレステリック液晶層の如く円偏光を透過するタイプの輝度向上板では、そのまま偏光板に入射させることもできるが、吸収ロスを抑制する点よりはその透過円偏光を位相差板を介し直線偏光化して偏光板に入射させることが好ましい。ちなみにその位相差板

として1/4波長板を用いて偏光板と輝度向上板の間に配置することにより、円偏光を直線偏光に変換することができる。

【0025】可視光域等の広い波長範囲で1/4波長板として機能する位相差板は、例えば波長550nmの光等の単色光に対して1/4波長板として機能する位相差層と他の位相差特性を示す位相差層、例えば1/2波長板として機能する位相差層とを重畳する方式などにより得ることができる。従って偏光板と輝度向上板の間に配置する位相差板は、1層又は2層以上の位相差層からなるものであってもよい。

【0026】なおコレステリック液晶層についても、反射波長が相違するものの組合せにて2層又は3層以上重畳した配置構造とすることにより、可視光域等の広い波長範囲で円偏光を反射するものを得ることができ、それに基づいて広い波長範囲の透過円偏光を得ることができる。

【0027】本発明による光学部材は、損傷防止等を目的に光学素材の表面を外表面の表面粗さRaが0.03μm以上の保護フィルムにて接着被覆したものである。保護フィルムは、光学素材の表裏両面に設けうるが、一般には図例の如く保護フィルム1を光学素材の片面に設けて、光学素材の他面にはセパレータ4にて仮着カバーした粘着層3を設けた形態とされる。

【0028】前記において保護フィルムは、保護基材のみにても形成しうるが一般には、保護基材に粘着層を設けてその粘着層と共に保護基材を光学素材より剥離できるように形成される。一方、セパレータはそれが接着する粘着層3との界面で剥離できるように形成される。

【0029】従って通例、保護フィルムの場合にはその剥離で光学素材の表面が露出し、セパレータの場合にはその剥離で粘着層が光学部材に残存して、その粘着層を液晶セル等の他部材との接着に利用することができる。なお保護フィルムについてもセパレータの如く、それが接着する粘着層を光学素材に残存させるように形成することもできる。

【0030】前記した保護基材に設ける粘着層や光学素材に残存させる粘着層の形成には、適宜な粘着性物質や粘着剤を用いることができ、特に限定はない。ちなみにその例としては、アクリル系重合体やシリコン系ポリマー、ポリエステルやポリウレタン、ポリアミドやポリエーテル、フッ素系やゴム系などの適宜なポリマーをベースポリマーとするものなどがあげられる。

【0031】就中、光学素材に残存させる粘着層の形成には、アクリル系粘着剤の如く光学的透明性に優れ、適度な濡れ性と凝集性と接着性の粘着特性を示して、耐候性や耐熱性などに優れるものが好ましく用いうる。

【0032】また上記に加えて光学素材に残存させる粘着層は、吸湿による発泡現象や剥がれ現象の防止、熱膨張差等による光学特性の低下や液晶セルの反り防止、ひ

いては高品質で耐久性に優れる液晶表示装置の形成性などの点より、吸湿率が低くて耐熱性に優れるものにて形成されていることが好ましい。

【0033】粘着層は、例えば天然物や合成物の樹脂類、就中、粘着性付与樹脂、ガラス繊維やガラスビーズ、金属粉やその他の無機粉末等からなる充填剤や顔料、着色剤や酸化防止剤などの粘着層に添加されることのある適宜な添加剤を含有していてもよい。また光学素材に残存させる粘着層は、微粒子を含有して光拡散性を示すものなどであってもよい。

【0034】保護基材又は光学素材への粘着層の付設は、適宜な方式で行いうる。ちなみにその例としては、例えばトルエンや酢酸エチル等の適宜な溶剤の単独物又は混合物からなる溶媒に粘着性物質ないしその組成物を溶解又は分散させて10~40重量%程度の粘着剤液を調製し、それを流延方式や塗工方式等の適宜な展開方式で保護基材又は光学素材の上に直接付設する方式、あるいは前記に準じセパレータ上に粘着層を形成してそれを保護基材又は光学素材の上に移着する方式などがあげられる。

【0035】粘着層は、異なる組成又は種類等のものの重畳層として保護基材又は光学部材に設けることもできる。粘着層の厚さは、使用目的や接着力などに応じて適宜に決定でき、一般には1~500μm、就中5~200μm、特に10~100μmとされる。なお保護基材又は光学部材に設ける粘着層は、組成や種類等が同じであってもよいし、異なるものであってもよい。

【0036】保護フィルムを形成する保護基材には、例えばプラスチックフィルムやゴムシート、紙や布、不織布やネット、発泡シートや金属箔、それらのラミネート体等の従来に準じた適宜な薄葉体を用いることができる。保護基材の厚さは、強度等に応じて適宜に決定でき、一般には500μm以下、就中5~300μm、特に10~200μmとされる。

【0037】なお外表面となる保護基材の表面が平滑である場合、Raに基づいて0.03μm以上の表面粗さは、例えばバフ処理やエンボス加工等の適宜な粗面化処理方式を適用して形成することができる。積み重ねによるブロッキングの防止、光学素子や粘着層への表面粗さの反映による光学特性や粘着特性の低下の防止などの点より保護フィルムの外表面における好ましい表面粗さRaは、0.04~10μm、就中5μm以下、特に0.05~1μmである。

【0038】一方、粘着層面を仮着カバーするセパレータは、粘着層を実用に供するまでの間、その汚染を防止することなどを目的とする。セパレータの形成は、前記の保護基材に準じた適宜な薄葉体に、必要に応じてシリコン系や長鎖アルキル系、フッ素系や硫化モリブデン等の適宜な剥離剤による剥離コートを設ける方式などにより行うことができる。



【0039】なお上記の光学部材を形成する偏光板や位相差板、輝度向上板や透明保護層、粘着層などの各層は、例えばサリチル酸エステル系化合物やベンゾフェノール系化合物、ベンゾトリアゾール系化合物やシアノアクリレート系化合物、ニッケル錯塩系化合物等の紫外線吸収剤で処理する方式などの適宜な方式により紫外線吸収能をもたせたものなどであってもよい。

【0040】本発明による光学部材は、液晶表示装置等の各種装置の形成などに好ましく用いることができる。その液晶表示装置は、本発明による光学部材を液晶セルの片側又は両側に配置してなる透過型や反射型、あるいは透過・反射両用型等の従来に準じた適宜な構造を有するものとして形成することができる。

#### 【0041】

##### 【実施例】実施例1

厚さ80 $\mu\text{m}$ のポリビニルアルコールフィルムをヨウ素水溶液中で5倍に延伸処理して形成した偏光フィルムの両側にポリビニルアルコール系粘着層を介してトリアセチルセルロースフィルムを接着してなる厚さ約180 $\mu\text{m}$ の偏光板の片面に、厚さ50 $\mu\text{m}$ のポリエステルフィルムの裏面に厚さ20 $\mu\text{m}$ のアクリル系粘着層を設けてなる保護フィルムをその粘着層を介して接着した。

【0042】次に前記偏光板の他面に、厚さ38 $\mu\text{m}$ のポリエステルフィルムからなるセバレータの裏面にシリコン系剥離コートを紹介厚さ25 $\mu\text{m}$ のアクリル系粘着層を設けてそれをセバレータと共に接着して光学部材を得た。なお前記した保護フィルムの外表面の表面粗さRaは、表面粗さ計（東京精密社製、サーフコム、以下同じ）による測定にて0.06 $\mu\text{m}$ であった。

##### \*【0043】実施例2

偏光板のセバレータを剥がしてそれにポリカーボネートフィルムを170℃で一軸延伸処理してなる位相差板を接着し、その位相差板にセバレータに設けた厚さ25 $\mu\text{m}$ のアクリル系粘着層をセバレータと共に接着したほかは実施例1に準じて光学部材を得た。

##### 【0044】実施例3

位相差板として、傾斜配向のディスコティック液晶層をフィルム基材にて支持してなるもの（富士フィルム社製、WVA02A）を用いたほかは実施例2に準じて光学部材を得た。

##### 【0045】実施例4

コレステリック液晶層を支持するフィルム基材と1/4波長板との積層体からなる輝度向上板（日東電工社製、PCF350）を厚さ25 $\mu\text{m}$ のアクリル系粘着層を介して、保護フィルムを剥がした偏光板に接着し、その剥がした保護フィルムを輝度向上板の露出面に接着したほかは実施例1に準じて光学部材を得た。

##### 【0046】比較例

保護フィルムとして、外表面の表面粗さRaが0.02 $\mu\text{m}$ のものを用いたほかは実施例1に準じて光学部材を得た。

##### 【0047】評価試験

実施例、比較例で得た光学部材の30単位を順次積み重ねてそれをポリエチレン製内袋と防湿アルミ製外袋とで減圧下に密封処理して48時間放置したのち開封して、ブロッキングの有無を調べた。その結果を次表に示した。

##### \*【0048】

実施例1	実施例2	実施例3	実施例4	比較例
ブロッキング	なし	なし	なし	あり

【0049】前記において、比較例では保護フィルム面を介して各单位がブロッキングしていたが、実施例1～4ではブロッキングせず、その積み重ね体を自動接着処理機に供して各单位毎にスムーズに分離して液晶セルに接着処理でき複数単位の取り込みによる装置のストップは生じなかった。

#### 【図面の簡単な説明】

##### 【図1】光学部材例の断面図

##### 【図2】他の光学部材例の断面図

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##### ※【図3】さらに他の光学部材例の断面図

#### 【符号の説明】

- 1：保護フィルム
- 2：偏光板（光学素材）
- 3、31、32：粘着層
- 4：セバレータ
- 5：位相差板（光学素材）
- 6：輝度向上板（光学素材）

【図1】



【図2】



【図3】



## フロントページの続き

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